

CLAIMS

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1. A porous silicon carbide sinter having a structure formed by silicon carbide crystals (21, 22) that includes  
5 opened pores (23), wherein the porous sinter has a silicon carbide crystal average grain diameter of  $20\mu\text{m}$  or greater, a porosity of 40% or less, and a thermal conductivity of  $80\text{W/m}\cdot\text{K}$  or more.

10 2. A porous silicon carbide sinter having a structure formed by silicon carbide crystals (21, 22) that includes opened pores (23), wherein the porous sinter has a silicon carbide crystal average grain diameter of  $20\mu\text{m}$  to  $100\mu\text{m}$ , a porosity of 5% to 30%, and a thermal conductivity of  $80\text{W/m}\cdot\text{K}$   
15 or more.

3. The porous silicon carbide sinter according to claim 1 or 2, characterized in that the silicon carbide crystals include 10vol% to 50vol% of fine silicon carbide  
20 crystals (21) having an average grain diameter of  $0.1\mu\text{m}$  to  $1.0\mu\text{m}$  and 50vol% to 90vol% of rough silicon carbide crystals (22) having an average grain diameter of  $25\mu\text{m}$  to  $150\mu\text{m}$ .

4. A method for manufacturing a porous silicon  
25 carbide sinter having a structure formed by silicon carbide crystals (21, 22) that includes opened pores (23), wherein the porous silicon carbide sinter has a silicon carbide crystal average grain diameter of  $20\mu\text{m}$  or greater, a porosity of 30% or less, and a thermal conductivity of  
30  $80\text{W/m}\cdot\text{K}$  or more, the method comprising the steps of:

adding 10 parts by weight to 100 parts by weight of a fine powder of  $\alpha$  silicon carbide having an average grain diameter of  $0.1\mu\text{m}$  to  $1.0\mu\text{m}$  to 100 parts by weight of a

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rough powder of  $\alpha$  silicon carbide having an average grain diameter of  $5\mu\text{m}$  to  $100\mu\text{m}$  and uniformly mixing the rough powder and the fine powder;

molding a mixture obtained in the mixing step into a  
5 predetermined shape to produce a molded product; and  
sintering the molded product within a temperature range of  $1700^{\circ}\text{C}$  to  $2400^{\circ}\text{C}$  to produce a sinter.

5. A member (2) used in a wafer grinder, wherein the  
10 wafer grinder member is formed from the porous silicon carbide sinter according to any one of claims 1 to 3.

6. A wafer grinder table having a grinding surface  
(2a) for grinding a semiconductor wafer held on a wafer  
15 holding plate, the table including:

a plurality of bonded base materials (11A, 11B), each formed from the porous silicon carbide sinter according to any one of claims 1 to 3; and

a fluid passage (12) formed in a bonding interface of  
20 the base materials.

7. A silicon carbide-metal composite having a porous structure formed by silicon carbide crystals (21, 22) that includes opened pores (23), wherein the opened pores are  
25 impregnated with metal, wherein the silicon carbide-metal composite has a silicon carbide crystal average grain diameter of  $20\mu\text{m}$  or greater, a porosity of 30% or less, and a thermal conductivity of  $160\text{W/m}\cdot\text{K}$  or more, and wherein 100 parts by weight of silicon carbide are impregnated with 15  
30 parts by weight to 90 parts by weight of metal.

8. A silicon carbide-metal composite having a porous structure formed by silicon carbide crystals (21, 22) that

includes opened pores (23), wherein the opened pores are impregnated with metal, wherein the silicon carbide-metal composite has a silicon carbide crystal average grain diameter of  $20\mu\text{m}$  to  $100\mu\text{m}$ , a porosity of 5% to 30%, and a thermal conductivity of  $160\text{W/m}\cdot\text{K}$  or more, and wherein 100 parts by weight of silicon carbide are impregnated with 15 parts by weight to 50 parts by weight of metal.

9. The silicon carbide-metal composite according to claim 7 or 8, characterized in that 100 parts by weight of silicon carbide is impregnated with 15 parts by weight to 45 parts by weight of metal silicon.

10. The silicon carbide-metal composite according to claim 7 or 8, characterized in that 100 parts by weight of silicon carbide is impregnated with 20 parts by weight to 50 parts by weight of metal aluminum.

11. The silicon carbide-metal composite according to any one of claims 7 to 10, characterized in that the silicon carbide crystals include 10vol% to 50vol% of fine silicon carbide crystals (21) having an average grain diameter of  $0.1\mu\text{m}$  to  $1.0\mu\text{m}$  and 50vol% to 90vol% of rough silicon carbide crystals (22) having an average grain diameter of  $25\mu\text{m}$  to  $150\mu\text{m}$ .

12. A method for manufacturing a silicon carbide-metal composite having a porous structure formed by silicon carbide crystals (21, 22) that includes opened pores (23), wherein 100 parts by weight of silicon carbide is impregnated with 15 parts by weight to 50 parts by weight of metal in the opened pores, the average grain diameter of the silicon carbide crystals is  $20\mu\text{m}$  or greater, the porosity is

30% or less, and the thermal conductivity is 160W/m·K or greater, the method comprising the steps of:

adding 10 parts by weight to 100 parts by weight of a fine powder of  $\alpha$  silicon carbide having an average grain diameter of 0.1 $\mu$ m to 1.0 $\mu$ m to 100 parts by weight of a rough powder of  $\alpha$  silicon carbide having an average grain diameter of 5 $\mu$ m to 100 $\mu$ m and uniformly mixing the rough powder and the fine powder;

molding a mixture produced in the mixing step into a predetermined shape to produce a molded product;

sintering the molded product within a temperature range of 1700°C to 2400°C to produce a sinter; and

impregnating the molded product or the sinter with metal.

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13. The method for manufacturing a silicon carbide-metal composite according to claim 12, characterized in that 1wt% to 10wt%, in carbon weight converted value, of an organic substance serving as a carbide source is added to the molded product.

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14. A member (2) used in a wafer grinder, wherein the wafer grinder member is formed from the silicon carbide-metal composite according to any one of claims 7 to 11.

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15. A wafer grinder table having a grinding surface (2a) for grinding a semiconductor wafer held on a wafer holding plate, the table (2) including:

a plurality of bonded base materials (11A, 11B), each formed from the silicon carbide-metal composite according to any one of claims 7 to 11; and

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a fluid passage formed in a bonding interface of the base materials.

16. A wafer grinder table having a grinding surface (2a) for grinding a semiconductor wafer held on a wafer holding plate, the table (2) including:

5 a plurality of base materials (11A, 11B), each of which is a ceramic-metal composite formed by impregnating metal silicon in opened bores of a porous body made of silicon-containing ceramic;

10 a bonding layer (14) formed from the metal silicon to bond the base materials; and

a fluid passage (12) formed in a bonding interface of the base materials.

15 17. The wafer grinder table according to claim 16, characterized in that, in the ceramic-metal composite, the porous body includes silicon carbide crystals with an average grain diameter of  $20\mu\text{m}$  to  $100\mu\text{m}$ , has a porosity of 10% to 50%, and has a thermal conductivity of  $160\text{W/m}\cdot\text{K}$  or more, and wherein 100 parts by weight of silicon carbide is  
20 impregnated with 15 parts by weight to 50 parts by weight of the metal silicon.

25 18. The wafer grinder table according to claim 17, characterized in that the silicon carbide crystals include 10vol% to 50vol% of fine silicon carbide crystals (21) having an average grain diameter of  $0.1\mu\text{m}$  to  $1.0\mu\text{m}$  and 50vol% to 90vol% of rough silicon carbide crystals (22) having an average grain diameter of  $25\mu\text{m}$  to  $150\mu\text{m}$ .

30 19. The wafer grinder table according to any one of claims 15 to 18, characterized in that the bonding layer has a thickness of  $10\mu\text{m}$  to  $1500\mu\text{m}$ .